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## METERS; OVERSIZING<sup>1</sup>

BY WILLIAM R. EDWARDS

The controlling principles involved in determining the size and make of meter service should be economy and efficiency. Usually the water department furnishes the meter, and must keep the capital expense as low as possible, consequently the smallest meter that will do the work in any particular case is desirable. Fortunately the second requirement of efficiency is usually obtained by the same selection.

Oversizing is, in the author's opinion, a common fault, and it is better to err in the opposite direction, as in that case attention will be directed to the error by the consumer complaining of poor service, while on the contrary, if the service is oversized in the meter used, a substantial loss may be sustained by the department in under-registration.

Oversizing in meters may be compared to oversizing in automobile tires, in that they will both give longer lives, but the oversize auto tire may also use up more power to move the car and costs more. The oversized meter will not register all the water passing through it and costs more.

The experience of the Passaic Water Company, covering twenty years in time, and the setting, care and handling of some 22,000 meters, is that no matter how much care has been taken, the company has allowed itself to be influenced by the opinion of property owners, mill engineers, architects, etc., with the result that much larger meters were installed than were necessary. That the company's judgment has been swayed is clear by its experience following the installations of the first five or ten years. A careful watch of the performance of individual meters by following their registration, semi-annual tests as to sensitiveness and accuracy, a watch on the difference of water recorded following reduction in size or change in type of meter on a particular service, soon made the fact clear that in many cases meters of too large capacity had been used.

<sup>1</sup> Read before the New York Section, December 20, 1918.

This range covered the use of meters for residential service where  $\frac{3}{4}$ -inch and 1-inch sizes had been used when the  $\frac{5}{8}$ -inch was sufficient, to factory or commercial use, where from  $1\frac{1}{2}$ -inch to 6-inch meters were being used in situations that could better be served by  $\frac{3}{4}$ -inch to 2-inch meters.

For the last ten years, during which the business has developed at least 62.8 per cent, and the number of meters in use has increased by 99.9 per cent, it has not been found necessary to buy many meters above  $\frac{5}{8}$ -inch in size. The demands of a growing industrial section for meters of a size larger than this has been met by the withdrawal from service of meters which had previously been set larger than necessary, replacements being made by smaller meters or meters of a different type more suitable for the particular service.

The experience has led to fixing the following general rule covering residential installation: Up to 6 families, a  $\frac{5}{8}$ -inch meter; from 6 to 12 families, a  $\frac{3}{4}$ -inch meter; from 12 to 18 families, a 1-inch meter; from 18 to 25 or 30 families, a  $1\frac{1}{2}$ -inch meter.

For commercial or industrial service, the size and type of meter to be used is determined after all the information available as to the probable quantity to be used and the rate at which it will be drawn has been considered, bearing in mind also in determining the size, the psychology of the water user. Knowing that it is easier to increase than to decrease the size and that such a change leaves a pleased customer, the company is careful not to get an oversize original installation.

The objection of the customer to the placing of a meter of a smaller capacity than his judgment indicates to be necessary is usually satisfactorily met by the assurance that, if found necessary after trial, a larger size will be installed without expense to him.

Where the service demands a large volume at times, with the necessity of taking care of small flows, either of use or leakage, the compound type of meter has been found suitable. This condition frequently arises. For example, on a small town service, where fire protection is of primary importance, but where the ordinary range of draft is greater than the range provided for in a Venturi meter of proper size, a compound meter, which has a current meter for the larger demands with a positive measurement meter for the smaller, is the most suitable type. This condition is also met in many public buildings where flushometers are installed, although for apartment houses and the smaller tenements where the installa-

tion of compound meters of comparatively large size would be necessary to provide for the large flow demanded by flushometers, the use of flushometers is discouraged.

The author agrees with Mr. Caleb M. Saville in the conclusion of his paper read before the New England Water Works Association on November 14, 1918, that it is more effective and economical to install a larger service than has heretofore been the custom than to use a larger meter. Loss of head can be overcome by using the larger service more readily, more economically, and more effectively than by the size and type of meter selected.

Where a larger flow for short intervals is desired than can properly be provided for by the department, giving consideration to accurate registration and first cost of installation, such as filling tubs in a dyehouse, of which the Passaic Water Company has a great many, or providing for the demands of flushometers, the service may be secured by the use of tanks. This shifts the burden of the extra expense of installation from the water department to the customer, but this is justifiable.

The invariable rule of the Passaic Water Company is to use a meter of smaller size than the service to which it is attached. Installations are all made so that a meter can be changed to a different size or type readily and with little expense, in order that changes in use or unforeseen conditions may be easily and readily taken care of.

The determination of the size of the service and the size and type of the meter to be used for any consumer, should be with the water department. The operator of the department does or should know what is required for both proper service to the customer and economical and efficient service for the department.

All meters larger than 2 inches in size are installed so that they can be tested in place without the interruption of the service, and such tests are made twice yearly. All smaller meters are removed for periodical tests, the period being determined by the service which the meter is rendering, or by the requirements of the State Utility Commission, which requires that all meters must be tested after a fixed number of years of service, or after having passed a certain quantity of water, depending on the size.

In conclusion, the author agrees again with Mr. Saville, that more care is needed in the selection of meters for each particular service. The selection should be made by a man experienced in supplying water and with an accurate knowledge of the mechanical qualities

of meters, their limitations and possibilities. Much money can be saved a department, in both installation and operating cost and in securing a full registration of all water delivered, by proper attention to details. Then after the selection as to size and type has been made, one must not be lulled into false security. The water meter is a machine that needs watching. The department has this peculiarity frequently called to its attention by the irate consumer with the high bill, but it should also be warned by the unusually low bill. The price which must be paid for maintaining revenue is eternal vigilance.

### DISCUSSION

LEONARD METCALF: The paper invites some questions, such as who bears the expense of repairing the meters, what proportion of the services are metered and what proportion of the water pumped furnishes a revenue.

A. E. HANSEN: It is surprising to hear that a  $\frac{5}{8}$ -inch meter is sufficient for eight families, and as this size must be dependent for its success on rather high pressures, the author should state the latter.

ALLEN HAZEN: The Spring Valley Water Company in San Francisco has recently become 100 per cent metered. All manufacturing and commercial services have been metered for years and on many of these services the meters were much larger than were necessary. In connection with the complete metering, a new schedule of water rates has been established by the California Railroad Commission which replaces all the old mixed schedules and is universally applied. The new schedule is in the form adopted by the New England Water Works Association. Under it there is a service charge for the service and meter, depending upon the size of the meter, and an additional charge for water. The use of this new schedule tends to bring about a better adjustment of the size of meters to the needs of the service. The company is facilitating this change by sending with each bill, where the quantity of water registered is altogether too small for the size of meter, a polite note to the taker calling attention to the conditions. This letter suggests to him that apparently a meter of a smaller specified size would answer his require-

ments and that, if he wishes, the company will substitute the smaller meter for the larger one without expense to him, and that with this done he will save so much per month on his bill. Sending these letters has promoted cordial relations between the takers and company, and very many takers are accepting the offer, with the result that the number of abnormally large meters is being steadily reduced.

WM. R. EDWARDS: In reply to Mr. Metcalf's question, it should be said that the company bears all the expense for repairing meters except when they are caused by frost or hot water. One of the towns supplied has all the services metered, in another 80 per cent are metered and in a third about 70 per cent. It is not practicable to say what percentage of the water pumped yields a revenue, because on the system as a whole there are too many flat rates. In Montclair only 65 per cent of the water is accounted for.

It is not surprising that our experience with  $\frac{5}{8}$ -inch meters brings out Mr. Hansen's question. We generally use a  $\frac{5}{8}$ -inch meter where the service supplies six families, but as a matter of fact no complaint has come about the supply furnished through a  $\frac{5}{8}$ -inch meter to twelve families. The pressure in these cases is 40 to 50 pounds. In Montclair, where the pressure is about 80 pounds, we are supplying without complaint through a  $\frac{5}{8}$ -inch meter a 12-family apartment house fitted with flushometers.